DOCUMENT RESUME

ED 250 844 EC 170 878

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TITLE WISC-R Subtest Pattern Stability and Learning Disabilities: A Profile Analysis.
PUB DATE Aug 84
NOTE 21p.; Paper presented at the Annual Meeting of the American Psychological Association (92nd, Toronto, Canada, August 24-28, 1984).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Education; *Intelligence Tests; *Learning Disabilities; *Profiles; Scores; Student Characteristics; *Test Interpretation
IDENTIFIERS *Wechsler Intelligence Scale for Children (Revised)

ABSTRACT

Profile analysis was performed on Wechsler Intelligence Scale for Children-Revised (WISC-R) scores of 29 learning disabled students (6-10 years old) in a Specific Learning Disabilities (SLD) program, to determine whether subtest patterns for initial and re-evaluation WISC-R administrations would differ significantly. Profile analysis was applied to test scores for each S, using two methods of grouping WISC-R subtests: (1) A. Bannatyne's recategorization and (2) the three major factors emerging from A. Kaufman's factor analytic studies of the WISC-R. Results suggested that no single pattern of factor or of Bannatyne category scores characterized the SLD group. The students in this study were a very heterogeneous group in respect to their WISC-R scores. Results of the individual profile analysis demonstrated that the pattern of factor and category scores was very stable, even over extended periods of time, when stringent statistical criteria were used to evaluate the degree of change which occurred between pre- and post-test subtest patterns. Examination of the patterns exhibited by those Ss whose initial and re-evaluation profiles differed significantly revealed no consistency in location or direction of change. In addition, no characteristics could be identified which differentiated between Ss whose profiles showed a significant change and those whose profiles did not. (CL)

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ED250844

WISC-R SUBTEST PATTERN STABILITY AND LEARNING DISABILITIES: A PROFILE ANALYSIS

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Paper presented at the annual meeting of
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EC170878

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WISC-R SUBTEST PATTERN AND LEARNING DISABILITIES: A PROFILE ANALYSIS

Considerable research has been conducted in an attempt to identify a characteristic Wechsler Intelligence Scale for Children-Revised (WISC-R) profile for the learning disabled (LD) population. Numerous studies have demonstrated high or low scores on particular subtests or groupings of subtests for LD groups (Clarizio & Bernard, 1981; Hughes, 1977; Stevenson, 1980; Strichart & Love, 1979; Tabachnick, 1979; Vance, Gaynor, & Coleman, 1976; Vance & Singer, 1979). The results of similar studies, however, have also shown that subtest patterns cannot be utilized for diagnosis of learning disabilities for several reasons. Many LD individuals do not conform to the group pattern (Dean, 1978; Gordon, 1977; Thompson, 1981), the characteristic pattern is frequently not exhibited by special subgroups of LD children (Anderson, Kaufman, & Kaufman, 1976; Gutkin, 1979; Schiff, Kaufman, & Kaufman, 1981; Zarske & Moore, 1982), and the typical LD profile is often evident within other exceptional and non-exceptional groups (Henry & Wittman, 1981; Schooler, Beebe, & Koepke, 1978; Smith, Coleman, Dokecki, & Davis, 1977b; Webster & Lafayette, 1980).

The focus of interest in the WISC-R subtest patterns frequestly can suggest hypotheses about an individual's cognitive strengths and weaknesses which may lead to further assessment and/or subsequent recommendations for remediation or accommodation strategies in the student's educational program (Galvin,

1981; Kaufman, 1979a , 1981; Stevenson, 1980; Thompson, 1981). The question of the stability of the WISC-R subtest patterns for LD students is important in regard to such interpretations. One might assume that valid interpretation requires a reliable profile, composite scores of grouped subtests remaining relatively stable over time. Conversely it is also possible that subtest patterns may reflect substantial change due primarily to the impact of the student's special educational program.

Although Smith (1978) and Vance, Blixt, and Ellis (1978) demonstrated the moderate to high reliability of individual WISC-R subtests for LD students over a seven month and two year-two month pre to post-test interval, the question of the stability of subtest patterns has not been answered. Other investigations (Byrd, Buckhaldt, & Byrd, 1981; Stevenson, 1980) have shown substantial similarity in some subtest scores as well as significant differences in others for students of different ages who were referred for evaluation of their academic difficulties. The number of these students who were subsequently identified as learning disabled was not reported, however, and the existence of differences in WISC-R subtest patterns between groups of students of different ages does not demonstrate that similar changes occur over time for one group of students. The purpose of this investigation was to determind whether subtest patterns for initial and re-evaluation WISC-R administrations with LD students would differ signifi-

cantly. The technique of profile analysis was utilized to determine if significant differences occurred with respect to the individual profile (initial and re-evaluation). Profile analysis allows for the comparison of individual rather than group comparison of subtest pattern scores.

Subjects:

The subjects in this study were 29 students who were officially staffed into the Specific Learning Disabilities (SLD) program and attended self-contained classrooms in two special schools within a large school distrct in central Florida. The 29 subjects included 22 males and 7 females. Chronological ages ranged from 6 years, 2 months to 10 years, 7 months (median age 8 years, 1 month) at the time of the first evaluation and 8-10 to 12-11 (median age 10-11) for the second evaluation.

Full scale IQ scores of the group ranged from 58 to 112 (mean 84.76) for initial evaluation and from 69 to 111 (mean 84.90) for re-evaluation. Verbal IQ (VIQ) scores fell between 46 and 109 (mean 81.96) and Performance IQ (PIQ) scores between 64-114 (mean 81.41) for the first evaluation. For the second evaluation, VIQ scores ranged from 67 to 103 (mean 81.41) and PIQ scores from 67 to 118 (mean 91.45).

Method:

Two methods of grouping WISC-R subtests were utilized in this investigation; Bannatyne's (1971, 1974) recategorization and the three major factors emerging from factor analytic

studies of the WISC-R (Kaufman, 1975, 1979). Factor scores, Verbal Comprehension (VC), Perceptual Organization (PO) and Freedom From Distractibility (FFD), were computed by summing and averaging the scaled scores on the subtests associated with that factor. The subtests comprising VC were Information (I), Similarities (S), Vocabulary (V) and Comprehension (C); those for PO were Picture Completion (PC), Picture Arrangement (PA), Block Design (BD) and Object Assembly (OA) with Arithmetic (A) and Coding Cd) making up FFD. A similar procedure of averaging subtest scores was followed for Bannatyne's categories with relevant subtests for each category being S, V and C for Conceptual, PC, BD and OA for Spatial, A and Cd for Sequential, and I, A and V for Acquired Knowledge. It is important to note that DS scores were available for an extremely small number of evaluations; therefore, these scores were excluded from analysis, and the FFD factor and Sequential category were prorated from two subtest scores.

The technique of profile analysis was used to compare the initial and re-evaluation WISC-R profiles which were drawn for each individual from both the factor and category scores. This analysis enabled a determination to be made of whether the two profiles (initial and re-evaluation) differed significantly in shape and, if not, whether they differed significantly in level.

Although profile analysis usually deals with group means, the technique was applied to test scores for each individual

based on the assumption that a score taken at a particular point in time is theoretically the mean of an infinitely large number of measures which could be taken simultaneously. The standard error of measurement of the test, therefore, would represent the standard deviation of those measurements or standard error of the mean.

To determine whether two profiles differ significantly in shape, a t test of the difference between the difference of two means, or in this case test scores for an individual must be made. Thus the difference between each two adjacent category or factor scores on the profile representing the initial evaluation is compared with the difference between the corresponding two adjacent scores on the re-evaluation profile.

To ascertain whether two profiles differ significantly in level, a t test of the difference between two means, or in this investigation test scores for one individual, is performed. Thus the difference between each category or factor score on the profile for the initial evaluation is compared with the same category or factor score on the re-evaluation profile.

To carry out these t tests it was necessary to establish an appropriate confidence level for this analysis. Although the 99% confidence level is frequently employed for tests of statistical significance, the 95% level was judged appropriate for this analysis based on Kaufman's (1979a) assertion that the .05 level of significance is sufficient for investigation of the WISC-R profile. The z score associated with this level

of significance is 1.95. Therefore, the difference of the difference between adjacent scores on the two profiles must exceed 1.95 X the standard error of the difference between the difference of two means for the profiles to differ significantly in shape. Furthermore, the difference between corresponding scores on the two profiles must exceed 1.95 X the standard error of the difference between two means for the profiles to differ significantly in level.

The standard error of the difference between two means was calculated using the formula $SE_{diff} = \sqrt{SE,^2 + SE_2^2}$ where SE is the standard error of the first mean and SE_2 the standard error of the second mean. Since as noted previously, the standard error of the mean was assumed to be the same as the standard error of measurement for comparison of these test scores the $SE_{diff} = \sqrt{SE_{meas}^2 + SE_{meas}^2} = \sqrt{2\ SE_{meas}^2} = \sqrt{2}\ SE_{meas} = 1.41 \text{ X } SE_{meas}$. Similarly the standard error of the difference between the difference of two means was computed from the formula $SE_{diff\ btwn\ diff} = \sqrt{2\ SE_{diff}^2}$. Since the SE_{diff} was determined to be (1.41) SE_{meas}, the $SE_{diff\ btwn\ diff} = \sqrt{2\ (1.41 \times SE_{meas})^2} = \sqrt{2 \times 2 \times SE_{meas}^2} = 2 \times SE_{meas}$.

NEXT, the mean standard of error of measurement for the WISC-R subtests, 1.4, was substituted in the preceding formulas. This value was calculated using the standard error of measurements listed for each subtest in the WISC-R manual, (Wechsler 1974) and its use was permissible since the values for

individual subtests exhibit little variance. Thus,

$SE_{diff} = 1.41 \times 1.4 = 1.97$ and

$SE_{diff\ btwn\ diff} = 2 \times 1.4 = 2.8$

If these values are utilized in the t tests comparing the initial and re-evaluation profiles, the difference of the difference between adjacent category or factor scores on the two profiles must exceed 1.95 x 2.8 or 5.46 for the profiles to differ significantly in shape, and the difference between corresponding category or factor scores must exceed 1.95 x 1.97 or 3.85 for them to differ significantly in level.

In order to illustrate the application of profile analysis to individual interpretation of the WISC-R profile, initial and re-evaluation profiles which differ significantly in shape and level will be presented. Figure 1 shows initial and re-evaluation profiles for one subject that differ significantly in shape for both factors and categories. Factor and category scores for both evaluations as well as the values for the differences between the differences of adjacent scores are shown, and those values that exceed 5.46 are circled. Figure 2 displays initial and re-evaluation subtest profiles for a second subject that differ significantly in level for both factors and categories. Again factor and category scores for the two evaluations are listed along with the values for the differences between corresponding scores. Those that exceed 3.85 are circled.

Results:

Table 1 illustrates the number and percentage of subject whose initial and re-evaluation profiles for the Bannatyne categories or Kaufman factors which are substatistically the same in respect to shape and level, differ significantly in shape or differ significantly in level.

The large majority of profiles reflect neither a significant change in shape or level. A somewhat greater number of profiles are significantly different when subtest scores are analyzed in terms of Bannatyne's recategorization in comparison to the three factors. The greater stability of WISC-R profiles analyzed in terms of the Verbal Comprehension, Perceptual Organization and Freedom from Distractibility factors can probably be attributed to several reasons. One, four subtests comprise two of the three factors as opposed to three subtests comprising each Bannatyne category. Statistically it seems logical to assume that the mean of four scores will be more stable than the mean of three scores. Two, the inclusion of the Acquired Knowledge category in Bannatyne's scheme likely lessens stability since each subtest included in this category is also included in one other category.

Conclusions:

It was evident from a summary of subtest profiles that no single pattern of factor or Bannatyne category scores charac-

terized this SLD group. The students in this study were a very heterogeneous group in respect to their WISC-R scores.

The results of the individual profile analysis demonstrated that the pattern of factor and category scores was very stable, even over extended periods of time, when stringent statistical criteria were utilized to evaluate the degree of change which occurred between pre and post-test subtest patterns. Examination of the patterns exhibited by those subjects whose initial and re-evaluation profiles differed significantly revealed no consistency in location or direction of change. In addition, no subject characteristics could be identified which differentiated between those subjects whose profiles showed a significant change and those who did not.

The results of this study are consistent with previous research demonstrating that LD students do not exhibit a single characteristic profile of WISC-R subtest scores. It was not possible, however, to confirm suggestions that the scores of LD students on some WISC-R subtests decline as they get older. In comparison to the results of studies investigating the stability of individual subtest scores, subtest patterns seemed to be more reliable over longer periods of time.

Application of the conclusions drawn from this study are problemmatic in several respects. First, generalization is

limited due to the factors discussed previously. Due to the small size and restricted nature of the sample, these subjects cannot be assumed to be representative of the entire population of LD children. In addition, only two methods of analyzing WISC-R subtest scores were utilized, while other schemes are frequently needed if valid interpretation of profiles which produces educationally relevant information is to be successful in actual practice. Even the two techniques used in this study had to be modified from desirable clinical practice due to the unavailability of Digit Span scores. It is unlikely that the meaning of the FFD factor or Sequential Ability is the same when composed of only A and Cd as opposed to DS, A and Cd. Therefore, it is quite possible that the inclusion of DS scores could change the pattern of results seen in this study.

The application of conclusions about the substantial stability of the WISC-R subtest patterns and consequent apparent validity of the use of these patterns for individual interpretation is also limited by the method in which the WISC-R profile is often interpreted by practitioners. Too often the criteria adopted to judge the significance of differences in scores is not as stringent as that utilized by profile analysis or recommended by experts in WISC-R interpretation. Since it is probable that subtest patterns are much less stable when more lenient criteria are adopted, much less confidence can be placed in these interpretations of

cognitive strengths and weaknesses and subsequent recommendations than is generally done. The main feature of a technique such as profile analysis is that it allows for the comparison of the individual's own performance.

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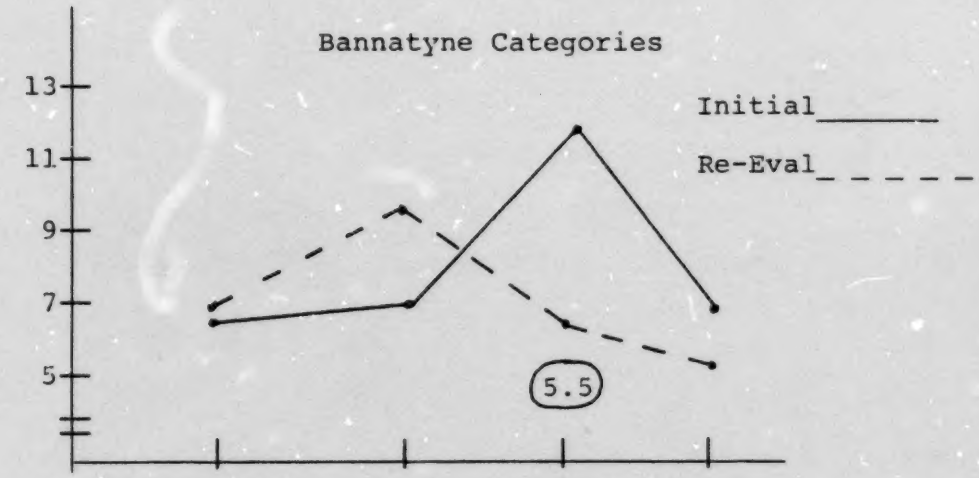
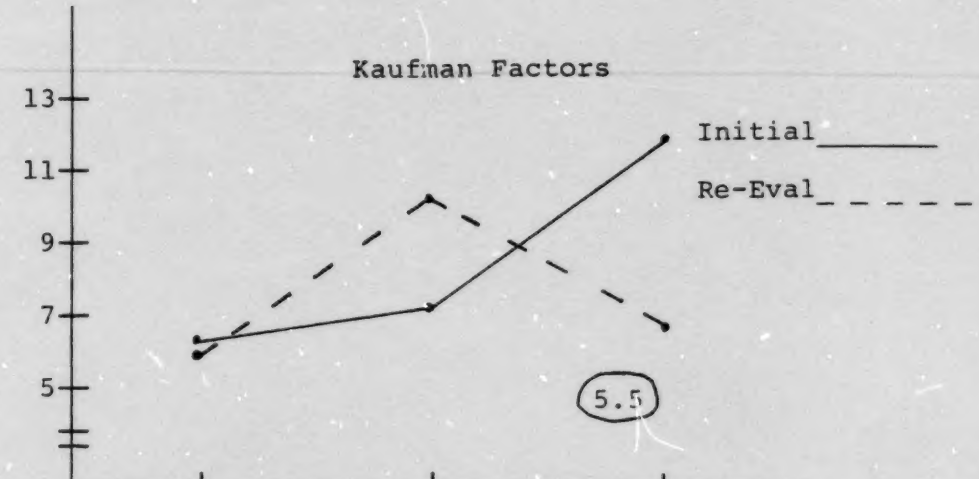
FIGURE 1

Initial and Re-evaluation Subtest Patterns
Differing Significantly in Shape by
Category and Factor



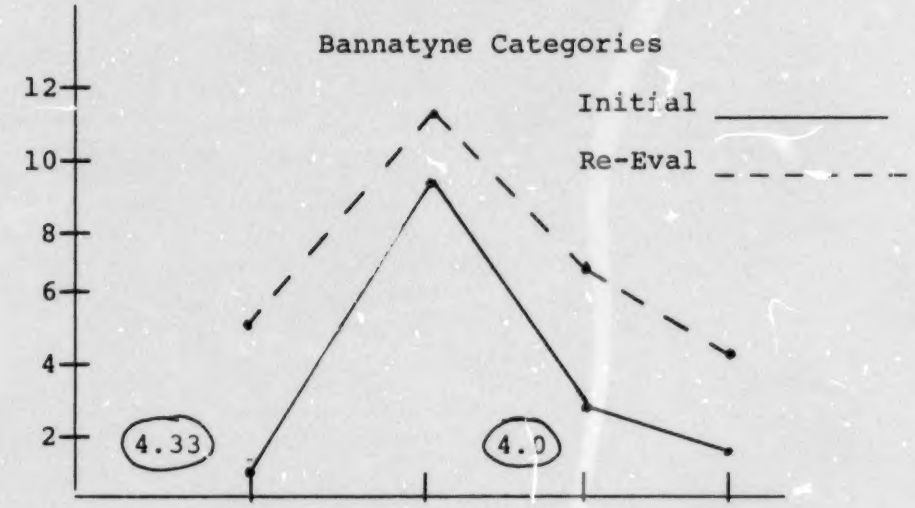
	Conc	Spat	Seq	AK
Initial	6.33	7.0	12.0	7.0
Re-Eval	6.67	9.67	6.5	5.67



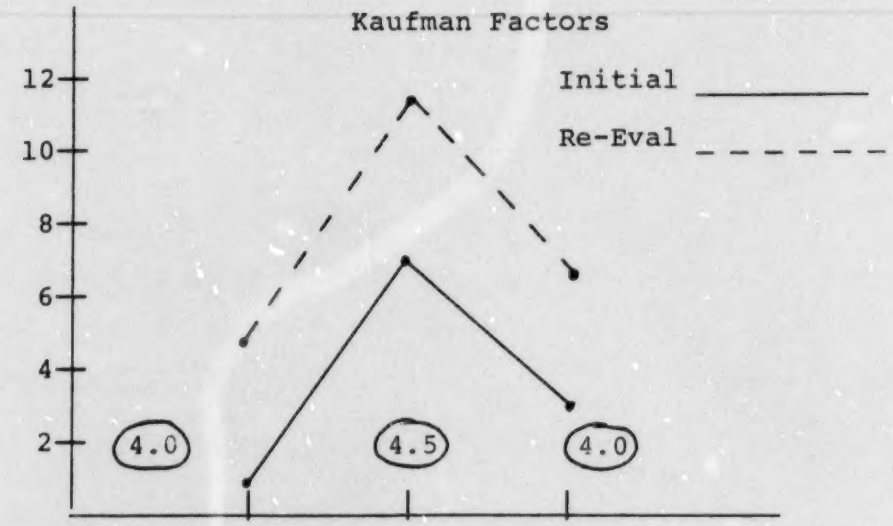
	VC	PO	FFD
Initial	6.5	7.0	12.0
Re-Eval	6.0	10.3	6.5

FIGURE 2

Initial and Re-evaluation Subtest Patterns
Differing Significantly in Level by
Category and Factor



	Conc	Spat	Seq	AK
Initial	1.0	9.33	3.0	1.67
Re-Eval	5.33	11.33	7.0	5.0



	VC	PO	FFD
Initial	1.0	7.25	3.0
Re-Eval	5.0	11.75	7.0

TABLE 1

Number and Percentage of WISC-R Profiles
Demonstrating Change by Category and Factor

	Bannatyne Categories		Kaufman Factors	
	N	%	N	%
Shape and Level Statistically Same	22	75.9	26	89.7
Shape Significantly Different ($p < .05$)	2	6.9	1	3.4
Level Significantly Different ($p < .05$)	5	17.2	2	6.9